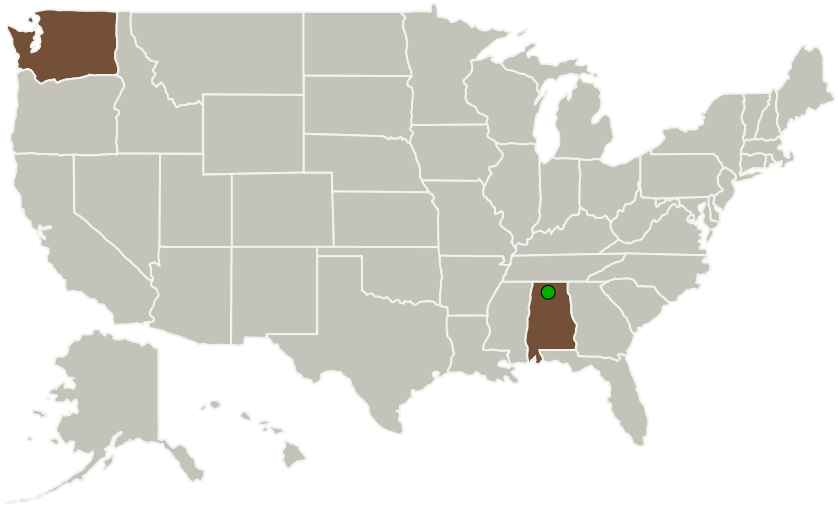
Positrusion Filament Recycling System for ISS, Phase II

Completed Technology Project (2015 - 2017)

Project Introduction

The Positrusion ISS Recycler enables recycling of scrap and waste plastics into high-quality filament for 3D printers to enable sustainable in-situ manufacturing on the ISS and future deep-space manned missions. In order to minimize astronaut time required for recycling, mitigate safety risks, and improve the quality of product relative to conventional filament extrusion methods, Tethers Unlimited, Inc. (TUI) has developed a novel "Positrusion" method for processing plastic pieces into filament. The Phase I effort successfully demonstrated Positrusion recycling of 3D-printed scrap ABS and Ultem materials back into filament, establishing the technology at TRL-4. Moreover, testing demonstrated that Positrusion achieves order-of-magnitude improvement in filament dimensional quality compared to commercially-available filament, which not only will improve the performance and reliability of ISS 3D printers but also make Positrusion competitive in terrestrial commercial applications, such as recycling plastic wastes in the home and office into useful 3D printer feedstock. The Phase II effort will deliver a complete ISS recycler payload system configured as an EXPRESS locker payload, flight qualified and at TRL-6. The Positrusion payload will provide recycling services aboard the ISS with operations that are as simple, safe, and reliable as a microwave oven, enabling astronauts to place scraps in the machine, push a button, and then move on to other duties while the recycler automatically processes the part into spooled filament.

Primary U.S. Work Locations and Key Partners



Positrusion Filament Recycling System for ISS, Phase II

Table of Contents

Positrusion Filament Recycling System for ISS, Phase II

Completed Technology Project (2015 - 2017)

Organizations Performing Work	Role	Type	Location
Tethers Unlimited Inc	Lead Organization	Industry	
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Washington

Project Transitions

May 2015: Project Start

April 2017: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138418)*

Images

Briefing Chart Image
Positrusion Filament Recycling System for ISS, Phase II *(https://techport.nasa.gov/image/126363)*

Final Summary Chart Image
Positrusion Filament Recycling System for ISS, Phase II Project Image *(https://techport.nasa.gov/image/133252)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Tethers Unlimited Inc

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jesse I Cushing

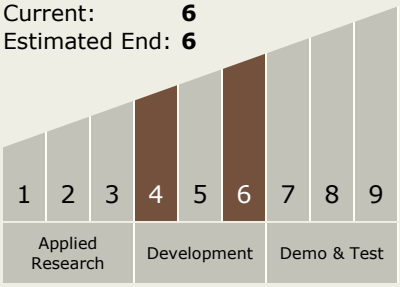
Co-Investigator:
Jesse Cushing

Positrusion Filament Recycling System for ISS, Phase II

Completed Technology Project (2015 - 2017)

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.4 Sustainable Manufacturing

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System